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Varicella — Past, Present, Future

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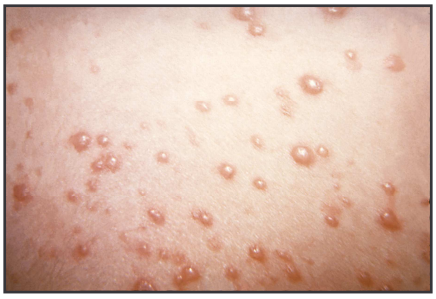
Primary infection with varicella zoster virus (VZV) causes varicella, or chickenpox. Varicella is an itchy, generalized rash often preceded by a mild fever and malaise. The rash begins on the trunk and face. Lesions start as maculopapular and then become vesicular with drying and crusting in 3-4 days. Typically between 250 and 500 lesions appear in several 'crops' so different staged lesions are present at one time. Lifetime immunity usually develops after infection, although VZV persists in the dorsal root ganglia. The virus can reactivate as herpes zoster (shingles) with lesions on a specific body area reflecting the affected nerve.



Typical varicella lesions— CDC / Dr. K.L. Hermann

VZV is highly contagious through airborne droplets or respiratory secretions reaching the upper respiratory tract or eye. Inhaling aerosols of fluid from lesions may also cause transmission. Humans are the only reservoir. The incubation period is 10-21 days (average 14-16). An infected person is communicable from 1 to 2 days before rash onset until all lesions have crusted (typically 4-7 days). About 90% of susceptible household contacts will become ill. In temperate regions there is a distinct peak of cases in late winter and early spring.

Classis chickenpox
Courtesy of CDC

Breakthrough varicella disease is an infection with wild-type (non-vaccine) VZV 42 days or more after vaccination. Breakthrough disease is usually much milder than for an unvaccinated person, usually with a shorter duration and fewer lesions (often less than 50). Lesions may never become vesicular. As a result, the lesions can be mistaken for bug bites and the entire illness may go undetected. Breakthrough disease is less contagious than typical varicella disease but can still be transmitted.

Breakthrough varicella
Courtesy of CDC

Continued page 2

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Complications

Varicella is usually considered benign but serious complications can occur in previously healthy people, especially adults. Secondary bacterial skin infections, pneumonia, encephalitis, and aseptic meningitis are potential complications that can be fatal. Before a vaccine was available, each year varicella resulted in about 11,000 hospitalizations and 100 to 150 deaths in the United States. Varicella is also uncomfortable for the patient and causes an average of 5-6 days of school absence and several missed days of work for caregivers as well as numerous visits to health care providers.

Years after the initial infection, the virus can reactivate from the dorsal root ganglia as herpes zoster (shingles) with lesions on a specific body area reflecting the affected nerve.

Shingles in an immunocompromised person
Courtesy of CDC

Vaccine

Before varicella vaccines became available, chickenpox was a universal childhood disease with about 4 million cases annually (15 cases per 1000 population) in the United States. Two live attenuated varicella vaccines are licensed, both manufactured by Merck & Co., Inc. VARIVAX® is a single antigen vaccine licensed in 1995 for children aged 12 months and older. ProQuad® is a combination measles-mumps-rubella-varicella (MMRV) vaccine licensed in 2005 for children aged 12 months through 12 years. Nationally stocks of ProQuad® have been depleted as of June 15, 2007, and providers should use the single antigen VARIVAX® vaccine at this time.

Varicella vaccine is generally well-tolerated. Local adverse reactions such as pain and redness at the injection site occur in about 22% of children after the first dose and in 25% after the second dose. Systemic reactions and serious adverse events are rare. One dose of varicella vaccine is 70-90% effective in preventing any clinical disease, ≥95% effective against moderate or severe disease, and 100% effective in preventing severe disease. Two doses given three months apart have significantly higher efficacy than one dose. Most breakthrough disease occurs 2-5 years after vaccination. The risk of breakthrough disease is 3.3-fold higher for one compared to two doses (7.3% versus 2.2%).

From 1997 to 2005, one dose varicella vaccine coverage in the United States increased from 27% to 88% for children aged 19-35 months. In Washington, coverage for this age group increased from 12.2% in 1997 to 76.6% in 2005.

Data from active surveillance sites in this country (see graph for example) show varicella incidence decreased 90% between 1995 and 2005; at the same time, average age of disease increased, shifting from ages 3-6 years in 1995 to ages 9-11 years in 2004. In addition, hospitalizations for varicella declined 88% overall

Continued page 3

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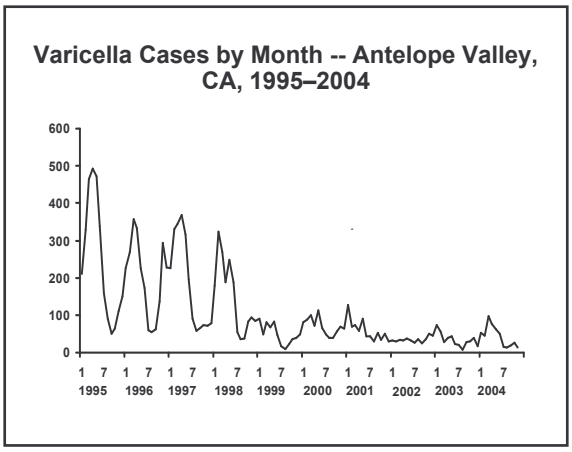
between 1994 to 2002 with infant hospitalizations down 100% and hospitalizations of adults aged 20-49 down 78%. Deaths from varicella have declined 92% among children aged 1 to 4 years and 88% percent among those 5-9 years old. In Washington, the average annual number of hospitalizations involving varicella decreased from 240 during 1990-1996 to 91 during 2003-2005. The number of deaths associated with varicella disease nationally also decreased from 25 for the period 1990-2001 to 1 death during 2002-2005.



Varicella Cases by Month -- Antelope Valley, CA, 1995–2004
Graph courtesy of CDC

After dramatic drops in incidence initially, the total number of cases appears to have plateaued. However, the proportion of reported breakthrough varicella infections has increased. In addition, outbreaks of varicella are still occurring even in groups with high one dose immunization coverage. As a result, the new recommendation is for two doses of varicella vaccine to be administered routinely.

ACIP and Washington Vaccine Recommendations/Requirements

In June 2007 the national Advisory Committee on Immunization Practices (ACIP) published recommendations in the *Morbidity and Mortality Weekly Report* making two varicella vaccine doses routine. The new schedule matches that of MMR: dose one at age 12-15 months and a second dose at age 4-6 years. The minimum interval between doses is 3 months for children through age 12, and 4 weeks for persons 13 and older. In addition, all adolescents and adults without evidence of immunity should receive two doses of the vaccine, especially health care providers and women planning on becoming pregnant.

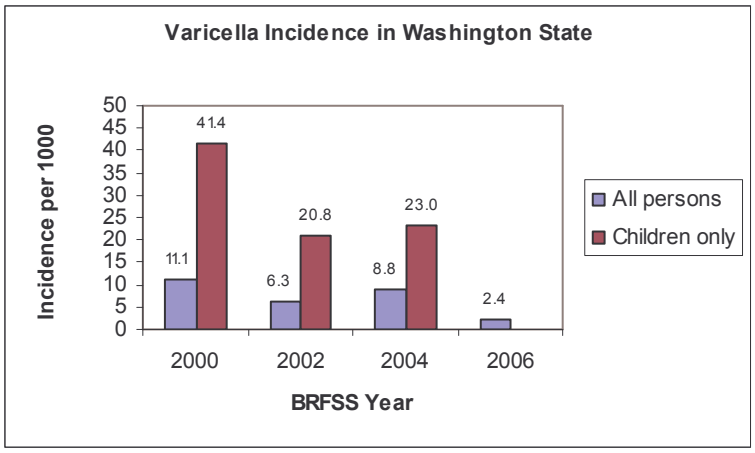
Varicella School Requirements

In Washington, children 19 months of age up to kindergarten entry attending licensed child care or preschool are required to show proof of immunity from varicella disease. School age children attending kindergarten, 1st grade, and children under age 13 years in 6th grade, are also required to show proof of immunity. Proof of immunity means one dose of varicella vaccine administered on or after the first birthday; parental documentation of history of varicella disease; or serologic proof of varicella immunity. Parents can exempt their child for personal, medical or religious reasons. This requirement will expand one grade level each school year, until kindergarten through sixth grade are covered. At this time there is no school entry requirement in Washington for a second dose of varicella vaccine; a second-dose requirement is anticipated within the next few years.

Continued page 4

Varicella Surveillance

In 1972 varicella became a nationally notifiable condition in the United States, but it was removed from the list in 1981 because varicella disease was so prevalent that reporting was a huge burden for health care providers and public health. Varicella deaths were made nationally reportable in 1999. Based on a recommendation by the Council of State and Territorial Epidemiologists (CSTE), in 2003 varicella morbidity became a nationally notifiable condition once again in an attempt to assess the impact of the vaccine introduced in 1995. At this time, varicella is not a notifiable condition in Washington State.



BRFSS estimate of varicella incidence 2000-2006
(child data for 2006 not yet available)

Data from the Washington Behavioral Risk Factor Surveillance System (BRFSS) suggest that the varicella incidence has dropped from 11.1 per 1000 in 2000 to 2.4 per 1000 in 2006, a level at which case-based varicella surveillance may be manageable.

Summary

With the addition of a second dose of varicella vaccine to the routine immunization schedule per the June 2007 ACIP recommendations, varicella may eventually become as rare in the United States as measles and rubella are today.

Resources

ACIP recommendations published in the MMWR (June 22, 2007 / 56(RR04);1-40)
http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5604a1.htm

CDC varicella website:
http://www.cdc.gov/vaccines/vpd-vac/varicella/default.htm#disease

DOH Immunization Program school and day care main page:
http://www.doh.wa.gov/cfh/Immunize/schools.htm

WAC section that applies to vaccinations and school entry:
http://apps.leg.wa.gov/WAC/default.aspx?cite=246-100-166

Pink Book varicella chapter:
http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/varicella.pdf